

I CLAIM:

1. A semiconductor device comprising:

a semiconductor die having a pad-mounting surface defining a horizontal plane, and a plurality of spaced apart first bonding pads formed on said pad-mounting surface; and

a multi-level interconnect structure formed on said pad-mounting surface, and including

a first insulating layer formed on said pad-mounting surface and formed with a plurality of first holes, each of which exposes a respective one of said first bonding pads from said pad-mounting surface,

a plurality of first level conductive horizontal bodies, each of which has an end section that fills a respective one of said first holes to electrically connect with a respective one of said first bonding pads, and an extension that extends from said end section, that is formed on said first insulating layer, and that has a connecting end horizontally offset from the respective one of said first holes,

a second insulating layer formed on said first insulating layer and formed with a plurality of first holes, each of which exposes said connecting end of said extension of a respective one of said first level conductive horizontal bodies from said second

insulating layer, and

a plurality of second level conductive vertical bodies, each of which fills a respective one of said first holes in said second insulating layer to electrically connect with said connecting end of said extension of a respective one of said first level conductive horizontal bodies, and each of which has a connecting end that extends through the respective one of said first holes in said second insulating layer.

2. The semiconductor device of Claim 1, further comprising a third insulating layer formed on said second insulating layer and formed with a plurality of first holes, said connecting end of each of said second level conductive vertical bodies extending into a respective one of said first holes in said third insulating layer.

3. The semiconductor device of Claim 2, further comprising a plurality of conductive bumps, each of which extends into a respective one of said first holes in said third insulating layer, and each of which is electrically connected to said connecting end of a respective one of said second level conductive vertical bodies.

4. The semiconductor device of Claim 1, wherein said semiconductor die further has a plurality of spaced apart second bonding pads formed on said pad-mounting

surface, said first insulating layer being further formed with a plurality of second holes, each of which exposes a respective one of said second bonding pads from said first insulating layer, said semiconductor
5 device further comprising a plurality of first level conductive vertical bodies, each of which fills a respective one of said second holes in said first insulating layer to electrically connect with a respective one of said second bonding pads, and each
10 of which has a connecting end that extends through the respective one of said second holes in said first insulating layer.

5. The semiconductor device of Claim 4, wherein said second insulating layer is further formed with a
15 plurality of second holes, each of which exposes said connecting end of a respective one of said first level conductive vertical bodies from said second insulating layer, said semiconductor device further comprising a plurality of second level conductive
20 horizontal bodies, each of which has an end section that fills a respective one of said second holes in said second insulating layer to electrically connect with said connecting end of a respective one of said first level conductive vertical bodies, and an
25 extension that extends from said end section of a respective one of said second level conductive horizontal bodies, that is formed on said second

insulating layer, and that has a connecting end horizontally offset from the respective one of said second holes in said second insulating layer.

6. The semiconductor device of Claim 5, further comprising a third insulating layer formed on said second insulating layer and formed with a plurality of first and second holes, said connecting end of each of said second level conductive vertical bodies extending into a respective one of said first holes in said third insulating layer, said connecting end of said extension of each of said second level conductive horizontal bodies extending into a respective one of said second holes in said third insulating layer.

7. The semiconductor device of Claim 6, further comprising a plurality of first and second conductive bumps, each of said first conductive bumps extending into a respective one of said first holes in said third insulating layer to electrically connect with said connecting end of a respective one of said second level conductive vertical bodies, each of said second conductive bumps extending into a respective one of said second holes in said third insulating layer to electrically connect with said connecting end of said extension of a respective one of said second level conductive horizontal bodies.

8. The semiconductor device of Claim 7, further

comprising a first metal layer that is formed on a respective one of said first bonding pads and that is disposed within a respective one of said first holes in said first insulating layer, each of said first level conductive horizontal bodies including a conductive paste layer that has a first portion extending from said first metal layer, and a second portion formed on said first insulating layer, and a second metal layer formed on and cooperating with said second portion of said conductive paste layer to define said extension of the respective one of said first level conductive horizontal bodies.

9. A method for making a semiconductor device that includes a semiconductor die having a pad-mounting surface defining a horizontal plane and a plurality of first bonding pads formed on the pad-mounting surface, the method comprising the steps of:

forming a first insulating layer on the pad-mounting surface;

forming a plurality of first holes in said first insulating layer, each of said first holes exposing a respective one of the first bonding pads from said first insulating layer;

forming a plurality of first level conductive horizontal bodies, each of which has an end section that fills a respective one of said first holes to electrically connect with a respective one of the

first bonding pads, and an extension that extends from said end section, that is formed on said first insulating layer, and that has a connecting end horizontally offset from the respective one of said first holes;

forming a second insulating layer on said first insulating layer;

forming a plurality of first holes in said second insulating layer, each of said first holes in said second insulating layer exposing said connecting end of said extension of a respective one of said first level conductive horizontal bodies; and

forming a plurality of second level conductive vertical bodies, each of which is electrically connected to said connecting end of said extension of a respective one of said first level conductive horizontal bodies, each of which fills a respective one of said first holes in said second insulating layer, and each of which has a connecting end that extends through the respective one of said first holes in said second insulating layer.

10. The method of Claim 9, further comprising forming a third insulating layer on said second insulating layer, and forming a plurality of first holes in said third insulating layer such that said connecting end of each of said second level conductive vertical bodies extends into a respective one of said first

holes in said third insulating layer.

11. The method of Claim 10, further comprising forming a plurality of conductive bumps, each of which extends into a respective one of said first holes in said third
5 insulating layer, and each of which is electrically connected to said connecting end of a respective one of said second level conductive vertical bodies.

12. The method of Claim 9, the semiconductor die further having a plurality of spaced apart second
10 bonding pads formed on the pad-mounting surface, further comprising:

forming a plurality of second holes in said first insulating layer, each of said second holes in said first insulating layer exposing a respective one of
15 the second bonding pads from said first insulating layer; and

forming a plurality of first level conductive vertical bodies, each of which fills a respective one of said second holes in said first insulating layer
20 to electrically connect with a respective one of the second bonding pads, and each of which has a connecting end that extends through the respective one of said second holes in said first insulating layer.

25 13. The method of Claim 12, further comprising:

forming a plurality of second holes in said second insulating layer, each of said second holes

in said second insulating layer exposing said connecting end of a respective one of said first level conductive vertical bodies from said second insulating layer; and

5 forming a plurality of second level conductive horizontal bodies, each of which has an end section that fills a respective one of said second holes in said second insulating layer to electrically connect with said connecting end of a respective one of said
10 first level conductive vertical bodies, and an extension that extends from said end section of a respective one of said second level conductive horizontal bodies, that is formed on said second insulating layer, and that has a connecting end
15 horizontally offset from the respective one of said second holes in said second insulating layer.

14. The method of Claim 13, further comprising forming a third insulating layer on said second insulating layer, and forming a plurality of first and second
20 holes in said third insulating layer such that said connecting end of each of said second level conductive vertical bodies extends into a respective one of said first holes in said third insulating layer, and that said connecting end of said extension of each of said
25 second level conductive horizontal bodies extends into a respective one of said second holes in said third insulating layer.

15. The method of Claim 14, further comprising forming a plurality of first and second conductive bumps such that each of said first conductive bumps extends into a respective one of said first holes in said third
5 insulating layer to electrically connect with said connecting end of a respective one of said second level conductive vertical bodies, and that each of said second conductive bumps extends into a
10 insulating layer to electrically connect with said connecting end of said extension of a respective one of said second level conductive horizontal bodies.